MONANA

JOURNAL of the AUSTRALIAN METEOROLOGICAL ASSOCIATION

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FOREWORD

Everyone of us is, at heart, an amateur meteorologist, and, if a census were taken, I have no doubt we would find far more amateur meteorologists than any other type of amateur in the world.

Our daily decisions as to how we dress in the morning, what we eat during the day, and even what we wear to bed at night are governed by the weather.

It is no wonder, then, that there has been such a tremendous response to the formation of the Australian Meteorological Association, which comes at a very exciting moment in the history of Meteorology.

With rockets carrying men around our earth and to the moon, satellites beaming back pictures of the clouds and weather systems several times daily, and computers available to treat the thousands of pieces of data within minutes of reception, there is an ever increasing interest in weather and the Science of Meteorology - the study of the atmosphere.

Trade and industry are becoming more and more aware of the value of the forecasting and warning services for improving the efficiency and economy of their operations. Floods, fires and famine are products of nature and each is controlled by the weather which, itself, is uncontrollable. This makes its study more fascinating and challenging.

The aborigines attributed lightning and thunder to the activities of the MONANA, the "spirit people in the sky", and the objective of this Association is to foster greater interest in these phenomena and all other aspects of Meteorology. In doing so, it must bring about a greater appreciation of the value of the Meteorological Services to the community.

A MESSAGE FROM THE PRESIDENT

Late in 1967 a letter was sent to the various newspapers, radio stations etc. explaining the proposal for the formation of the Australian Meteorological Association and inviting applications from persons who would be interested in forming such an Association.

An excellent response resulted and invitations were extended to 15 people of various occupations to attend a meeting at the Bureau's office. A Steering Committee was formed to study, and make amendments to, the proposed Constitution, and to make arrangements for the official launching of the Association. This was held in the Police Auditorium on the night of February 20th 1969. The Guest Speaker was Dr. W.J. Gibbs who gave a very interesting address on the history of Meteorology. This was well received not only by the potential members, but was also the subject of favourable comment from several of our distinguished visitors.

We were very grateful to the media for their generous response to our requests for publicity which resulted in 280 people attending the launching. It was very gratifying to see such a large number at the Meeting, and the speeches and film (Is Anyone Doing Anything About It?), as well as the coffee and biscuits, were very well received.

Up to this stage we had quite a number of financial members but the list was considerably augmented as a result of this first gathering. However, we still had no official organisation nor Committee. This was rectified at the Annual General Meeting, attended by 105 persons, on Thursday April 10th 1969, at the Adelaide University, when the Committee was confirmed and the Constitution formally adopted.

The Foundation Committee members in S.A. are -

President	J. Hogan	Bureau of Meteorology
Vice President	B. Mason	Geography Department, Adelaide University
Secretary	L. Mitchell	Bureau of Meteorology
Treasurer	M. Moncrieff	Bureau of Meteorology
	R. Culver	Civil Engineering Dept., Adelaide University
	R. Calvesbert	Inspector of Police
	K. Cook	Commercial Photographer
	A. Welbourn	Architect
	W. Slaytor	Teachers Training College

At the conclusion of the formal meeting illustrated talks on recent interesting Met. situations were given by Mr. Lynn Mitchell, Mr. Mark Williams and myself.

Comments were then called for on any aspect of the night's proceedings, proposals for future meetings, venue, number of meetings per year etc.

It was suggested that four meetings a year were insufficient and a show of hands indicated an almost unanimous vote in favour of bi-monthly meetings. It was also recommended that the possibility of an alternative meeting place where coffee and biscuits could be served after the meeting should be considered.

The next meeting was held in the Master Builders Association Hall in South Terrace on the night of June 12th, with the very satisfactory attendance of 102, despite the fact that apologies were received from many members.

("MONANA", the title of this publication is an aboriginal word for the Spirit People of an Adelaide Tribe now living in the sky.)

Mr. Mason, Senior Lecturer in Geography at the Adelaide University, gave a very interesting address on pressure and winds, and with visual aids gave a very simple but clear explanation of why the winds blow around pressure systems.

This was followed with an explanation by myself of the measurement of pressure by using the aneroid barometer and how it can be used to prepare "home made" forecasts.

Summaries of these papers are included in this bulletin, together with a copy of the Bureau's pamphlet on the use of the Aneroid Barometer.

We now have 197 members of whom 114 are from the Metropolitan Area, 35 from the country and 48 Junior Members.

My thanks are due to Mr. R. Kingsland C.B.E., D.F.C., who has written the Foreword to this Journal. Mr. Kingsland qualified as a Meteorologist with the Bureau of Meteorology in 1937 while a member of the RAAF, and now heads the Commonwealth Department of the Interior, to which the Bureau of Meteorology belongs.

I would like to express my personal thanks to the members of the Committee, to Mrs. Joy Gould, my secretary, who has been responsible for all the typing and distribution of notices, and to all those who have co-operated in getting this Association off the ground. I would also like to take this opportunity to request members to encourage their friends to enjoy the fun and benefits which are being derived from membership of this Association.

It is hoped that at our next meeting we will have the pleasure of meeting a lot of new members and many more potential members.

President

LIST OF FOUNDATION MEMBERS OF THE AUSTRALIAN METEOROLOGICAL ASSOCIATION

Metropolitan

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Austin F.R.
Beresford A.
Bills G.M. (Mrs.)
Birrell I.M.
Blackford C.
Boucaut J.H.P.
Bourman R.P.
Brady L.
Brewster (Mrs.)
Brooker J.P.
Byerley H.M.
Calvesbert A.R.
Carr E.J.C.
Catt M.J.
Charles F.L.
Chibnall R.J.
Clark B.E. (Miss)
Cook K.T.
Culver R.
Cunningham H.V.W.
Davey I. (Miss)
Davies F.S.
Deering V.R.
Doherty H.L.
Douglas W. (Mrs.)
Dunn J.
Ey W.T.
Fellows H.S. (Mrs.)
Field F.L.
Furler G.W.
Golley M.G.
Gore E.C.
Greer W.J.
Grant M.C.
Grimmer F.G.
Gross A.R.
Hamilton W.S.
Harding E.F. (Miss)
Hargrave L.M.S.
Harris N.D.
Hemer V. (Miss)
Hogan J.
Holmes P.R.
Howe W.A.T.
Hunwick R.J.
Inverarity J.
Keen T.G.
Kemp R.D.
Kidd D.
King P.M. (Miss)
Kuring R.N.

Metropolitan (Cont'd)

Lake C. (Mrs.)
Liberts I.A.
Malin R.B.
Martin B.G.H.
Mason B.
McFarlane J.S. (Mrs.)
McIntosh B. (Miss)
Mills G.
Mitchell L.R.
Modra R.E. (Mrs.)
Moncrieff M.E.
Morcombe C.R.
Morcombe K.R.
Mottram J.P.
Munro-Ford Dr. R.
Norris G.
Norris R.P.
Olsen A.M.
Ozols E.
Penhall F.L.
Potter R.B.
Prescott S.F. (Mrs.)
Preston Dr. J.
Radford Capt. B.
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Robin A.
Schakel B.M. (Miss)
Sibley J.M.
Simpson P.H.
Skailes Capt. L.J.
Slaytor W.J.H.
Smith A.D.
Smith A.G.
Smith J. (Mrs.)
Smith S.G.
Sprigg R.
Stevens B.J.
Stewart J.
Starr W.J.
Starr W.J. (Mrs.)
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Tolly J.
Whaley Capt. M.F.W.
Whatmough R.J.
Whitehead M. (Miss)
Whitman (Mrs.)
Whittle R.L.
Welbourn A.E.
Williams D.E.B.
Williams D.J.
Willing R.
Workman A.M.
Wright W.

LIST OF FOUNDATION MEMBERS OF THE AUSTRALIAN METEOROLOGICAL ASSOCIATION (Cont'd)

Junior

Aitken, Jeff
Ashby, Grant
Banders, Barry
Bannister, Peter
Bannister, Ann
Barnes, Ian
Barnes, Jonathon
Bolto, A.T.
Bulpin, Randy
Cahill, Richard J.
Carroll S.P.
Chappell, Timothy W.
Clarke, Jonathon
Cunningham, Christopher
Dubiel, Josephine
Dunn, Larry
Everton, John
Fenn, R.
Flint, Donald J.
Fraser, Robert J.
Frei, Tibor
Gilbert, Brian
Grimmer, Lyndon
Greer, Mary
Gross, Janet
Henschke, Chris
Hoebee, Eldert A.
Howie, L.
Leathem, John
MacDonald, James I.
MacNider, Keith
Maddern, Peter
Mercier, John P.
Modra, Anthony
Munro-Ford, Jonathon
Osborn, Mark A.
Patrick, John
Prescott, Michael T.
Reece, Colin
Reeve, Gary
Schultz, David
Sprigg, Douglas P.
Stewart, Christine
Stewart, Peter
Taeuber, Kim L.
Thalbourne, Michael A.
Wells, W.J.N.
Williams, Richard

Affiliate

Aitken, H.E.
Andrew, J.F.
Barr, R.W.
Bolto A.E.
Dunn, E. (Mrs.)
Easton, J.
Hahn, H.D.
Hall, F.J.
Hancock, H.R.
Heyer, R.
Johnson, D.
Langford, E.T.
McMahon, R.
Mathys, E.R.
Moucka, S.
Murray, G.E.
Ormsby, B.H.
Osborne, R.
Parsons, G.L.
Parsons, W.L.
Payne, G.K.
Price, A.J.
Potts, L.
Potts, K.
Roehr, E.T.
Schmidt, R.E.
Smith, K.J.
Storch, C.J.
Trenorden, H.M. (Mrs.)
Warburton, P.L.
Weyland, H.E.
Williams, R.R.
Williams, Rev. W.G.
Webber, G.R.

Student

Garrett, P.B.
Hickman, P.
Ward, J.W.

Pensioner

Kelly, J.J.
Sim, N. (Miss)
Sim, E.L. (Miss)
Shaw, J.V.
Williams, L.A.

Inaugural Meeting of the

AUSTRALIAN METEOROLOGICAL ASSOCIATION

held in

Police Auditorium, Angas Street, Adelaide

20/2/69

Address by MR. J. HOGAN

In his introductory address the Regional Director of Meteorology in S.A., Mr. John Hogan, welcomed the 280 guests particularly those from the country and the six from overseas who had flown in from Kangaroo Island during the afternoon to attend the Meeting.

Mr. Hogan went on to say -

"When this idea of having an Association was first conceived, I had two thoughts in mind. One was that there were Associations or Societies for every other branch of Science - there are the Geological Societies, Geographical Societies, Biological Societies and Medical Associations, but none for Meteorology, and I thought that it was time we did something about putting the Meteorologist on the map.

Secondly, we have had so many requests for information over the years from so many hundreds of people, and, in fact, I would say we get several hundred requests a year at the Bureau for information about the weather. Not just for Forecasts, not for data, but from people asking what caused the cyclone, what caused the thunderstorms, what caused the damage, and it gives us very great pleasure to be able to write to people and try and explain to them what has happened. This indicated a need for people to get together and discuss these matters and that is why we decided to call it an Association, as distinct from the learned Societies that the other branches of Science have. We thought it would be better to call it an Association of People interested in Meteorology, and not necessarily having any academic qualifications. The only qualification necessary being a real interest in weather and in Meteorology.

The third factor is the number of amateur meteorologists there are in the world, and particularly in South Australia. There are so many people who make their own forecasts every day. In fact, there are quite a lot of them who think that we are the amateurs and they are the professionals. Sometimes there is some justification I'm afraid. This is all very healthy, we like this competition. Don't think that we worry about people making their own forecasts, we love it, it is good and it incites us to do better, if possible.

I would state quite unequivocally, that there is far greater interest in Meteorology than in any other Branch of Science. In fact, I would go so far as to say there is more interest in Meteorology than in all the other sciences put together, because everybody every day makes his own forecasts. When you get out of bed you decide whether you will put on your woolly jumper or go without one, and whether you are going to do the washing or whatever it might be, but you base your decision on how you think the weather will affect you. You don't realise this, subconsciously or consciously you make these forecasts, and so you all join in being amateur meteorologists.

There are other people who have their own meteorological stations. I would say as a conservative estimate there would be 200 people in S.A. alone who have their own private meteorological stations. We have helped to set up these stations, we have given advice about the installation of equipment the taking of observations and the recordings, and we are always pleased to help them. They are mostly the younger people who are now being encouraged in the schools to take more interest in meteorology because it is becoming an important part of their education, particularly in the school of Geography.

It is not only the younger people who are really interested in Meteorology, and it is gratifying to me to look around and see some of the older people like myself who are interested in Meteorology.

This recalls to mind that only a week ago I had a request from an old gentleman over 80 years of age, who resides in a Rest Home. He had always been interested in Meteorology and has written me several letters asking me to explain something about the weather. Last week he wrote to me and asked two questions. The first was - "What is the average rate of travel of cold fronts as they move across the Bight?" The second was - "What precautionary measures should one take in the home against lightning when thunderstorms are about?"

Now, these are very thought provoking questions, as you can imagine, and I paid careful attention to my answers. However, I am not too certain whether my answer was satisfactory, as I doubt if they can be answered - I don't think we know what the average rate of movement of a cold front is. The main thing was that the interest was there. I wrote back to him and told him this, and the old gentleman sent my letter back with a poem he had written about the weather on the reverse side. The thing that amused me most, however, was that he had written

"Knock, knock, I hope you'll like this -

Knock Knock - Who's There?
Grammar School - Grammar School Who?
Gramma's cool now that she's taken her winter woollies off."

I think this was wonderful from an old chap of 80 years of age, and I think that anybody with an interest in Meteorology and other such interests, as he apparently has, should be nominated as the first Honorary Member of our Association.

Now there are many other questions like this that we could well ask, and that we will discuss, I hope, in this Association. I will just throw in two or three to create interest. One is - did you know that there were winds of 300 m.p.h. at about 40,000 ft. over Adelaide in August of last year, and what was the cause of these winds. Think how interesting it would be to get together one night, have a look at the charts and find out why we had winds of about 300 m.p.h. I'm not going to tell you the answer. I hope you'll come back and become members and we'll discuss it at one of our meetings.

Also it is known that sheep once existed in the Sahara Desert in an area where there is now only 1" of annual rainfall. What has happened to the climate over the years? Do we know anything about it? Do we know why?

Also, do you know that there is a very interesting sea creature in the north Atlantic called Globigerina Pachyderma? Well, we'll call him Glob to make it easy for me. Glob only lives in the North Atlantic where the 7.2^{o} sea water Isotherm determines what shape he will take. North of this Isotherm he develops himself into a clockwise spiral. South of this Isotherm he turns himself into an anticlockwise spiral. Now, just imagine what this could mean in tracing the climate of the world if we were to take cores of the ocean bottom and find out where our Glob turned from anticlockwise to clockwise and then trace where the 7.2^{o} Isotherm was thousands of years ago. This would be of wonderful assistance to us in investigating the past climatic changes of the world. The only thing that worries me about all this is what about all the poor little Globs who are born on the 7.2^{o} Isotherm. Some of them would want to go clockwise and others would probably want to go anticlockwise and finish up strangling themselves - that's something that is worth thinking about.

Apart from these few questions and interesting points that I have raised there are hundreds of other interesting facets of meteorology that we could discuss. I have no doubt whatsoever in my own mind, that we can have very many interesting, entertaining evenings, but many of you would probably like to discuss something more concrete and would, no doubt, be interested in some of our more difficult but interesting meteorological systems.

Now take for instance the system of the weekend before last. This was very interesting. It calls to mind one of my favourite proverbs, which is -

"When the stars begin to huddle,
The earth will soon become a puddle."

It's a very old one. Think of the puddle we had here last weekend when 70,000,000,000 tons of rain fell on S.A. That was an approximate amount, give or take a couple of thousand million tons.

We also have an interesting library of films and access to the national film library. The Bureau of Meteorology in Melbourne also has quite a library of very interesting films including some taken by a satellite. We also have access to most of the publications on meteorology from all over the world and hope to be able to take the interesting extracts out of these and publish them for you. We propose to publish the proceedings of our meetings twice yearly, together with any interesting articles on meteorology.

We have with us tonight Dr. W.J. Gibbs, The Director of Meteorology in Australia. Dr. Gibbs came from Melbourne today. He was ill yesterday but made a special effort to keep faith with us tonight. He is a very busy man and is the First Vice President of the World Meteorological Organisation and, as such, next week he will be taking part in the inner-cabinet discussions of the World Met. Organisation - the first time anything of this nature has even been held in Australia.

Dr. Gibbs started in the Bureau of Meteorology about 30 years ago. He went to New Guinea, then served for many years in R.A.A.F. after which he became Assistant Director Research and during this time he produced many original papers on Meteorology, and became a Master of Science at two different Universities - he wasn't happy with one so did it again. He has been Director of Meteorology in Australia since 1962 and in that time we have seen a tremendous expansion in our services, particularly in Antarctica where we have established several stations. He has also been responsible for bringing to Australia one of the three World Weather Watch Centres. One is in America and the other in Moscow.

Recently he has been responsible for installation of the large computer complex in Melbourne. Very soon we will be using the computers to do more of the chart drawing and it will not be too many years before the computers are doing most of the forecasting. I think there is no one more capable in Australia today than Dr. Gibbs to give you a picture of how all this progress is eventually going to affect you - the people."

Address by Dr. W.J. GIBBS

Director of Meteorology

"I will start my address by posing a question to Mr. Hogan that I hope you will solve at your first regular meeting. What would happen if one of the boy Globs from north of $7\frac{1}{2}^{o}$ were to meet a girl Glob from south $7\frac{1}{2}^{o}$? I hope that when you meet you might answer that question and if you can I think I might come along to the meeting.

Firstly, I'd like to say what a wonderful venture I think this is. Australia has been in need of this sort of move by someone like Mr. Hogan for a long long time. We have frequent seminars, symposiums, discussions between meteorologists. We use a lot of mathematics that we sometimes don't all understand and use a lot of very long words and sometimes don't always understand those. The specialist side of meteorology does become very specialised indeed and after all meteorology belongs to the people who live in the atmosphere and I think we are something like crabs at the bottom of the ocean. We are in a sea of air most of which is less than five miles deep. It is a very thin layer around the earth and we as citizens of this planet and inhabitants of this sea of air should show an interest - not only the specialists and professionals, but everyone needs to show an interest in his environment particularly as we live more closed-in in cities, so that I think this move, for which we can thank Mr. Hogan, is long overdue in Australia.

We don't need a professional society in Australia. I don't think we could support one - most meteorologists attend enough conferences, but we do need some place, some society, some association where people who are not specialists can get together and talk about weather. I hope this society prospers. I have received a letter from a gentleman in Victoria complaining that Mr. Hogan is too exclusive - they wouldn't let him join because he didn't live in S.A. I hope this becomes an Australian and not only a South Australian Association. I am sure that Mr. Hogan and other meteorologists in other states will find some way of bringing this about.

I am not an historian - but I would like to present a brief summary of what has happened in Meteorology since the white man first came here.

Prior to 1908 each state had its own Met. service but in that year they were united as a branch of the Commonwealth Public Service. Between 1908 and Second World War the Australian Met. Service started to pass from adolescence to maturity, and during the war period 1939-1946 some major developments took place.

Let's look at the first period 1788-1908. The people who have always been interested in Meteorology more than anyone else from the earliest days are the people who go to sea - the mariners and the sailors - and they really started meteorology off as a science.

Flinders' Journal related that, in the Investigator, he was the first man to come up Spencer's Gulf and St. Vincent's Gulf and find out they weren't channels leading to a big inland sea. Cook and Flinders were very good meteorologists.

In Flinders' Journal he has a study of the sea breeze - something that everybody that lives near the coast knows all about. In Europe and England the sea breeze is not nearly so marked. Flinders, who sailed down here in early 1800's, was a very fine meteorologist. He took observations which were recorded in his log and so the first observations were made in S.A. in early 1800's. Two things really put meteorology on its feet overseas. First there was the Crimean War, and at Balaklava a great storm came down and destroyed a lot of French and British ships. Nothing starts a Government moving more quickly than losing money, and they decided to "do something about this business of building ships and having them destroyed by storm".

But how do you get all the observations together to find out where the storm is and which way it's moving so that you can predict where it will be tomorrow? Obviously you can't do it by mail. You must have electrical equipment. Morse built the first radio telegraph in 1834 and it first came into use in Europe in late 1840's and this solved the problem of transmissions. About this time there were two marvellous sailors, Matthew Morley, an American, and Fitzroy, who later became an Admiral. Fitzroy sailed around the south coast of South America. Both were born about the same time that Flinders was jazzing around down here and both for some reason developed a great interest in Meteorology. I suppose as sailors they had to. When Chichester sailed around the world he followed the same winds and currents the old sailors used to look for. There's only one way to go, you don't go straight down the Atlantic and straight across. You start on the east Atlantic and go across to South America and follow the winds. These sort of things Fitzroy and Morley were discovering. These two started writing to each other. Morley wrote to Fitzroy in 1859 about the time Todd (later Sir Charles) started meteorology here. He said "Perhaps you may think it worthwhile some day to establish meteorological stations on the Heard Islands or in some other place in the region of the brave west winds of the Southern Hemisphere. I know of no enterprise in the meteorological way that, for so small an expenditure of time and money, promises richer rewards than this, both practically to the mariner and scientifically to the philosopher".

Now here is a man in America, a practical seaman, writing to another seaman in the United Kingdom proposing that they should put a meteorological station down here to the Southwest of Australia. Heard Island is between South Africa and Australia about latitude 55. What tremendous vision these two men had so many years ago to propose collaboration. Actually Fitzroy very soon after established the first British Meteorological Service in about 1855. S.A. started just one year later. About this time European meteorologists were getting together and saying let's combine to organise observing networks, and in 1873 the International Meteorological Organisation was formed which was the fore-runner of the present World Meteorological Organisation. In Australia meteorological observations were commenced in Paramatta in 1821. As soon as the Australians started to say to the United Kingdom that they wanted a Government of their own, meteorology really went ahead.

The first telegraph transmissions in the world were in 1844, and the first in Australia was only ten years later in Melbourne, and it's pretty obvious that telegraph was put in at a rapid rate all over Australia, because, only 30 years later Sir Charles Todd, a South Australian, who should be commemorated much more than he is, laid the overland telegraph from Adelaide to Darwin. Todd in his spare time organised the Met. services in S.A. - about 1856.

Russell, born in N.S.W., started a similar venture in N.S.W. soon after Todd. Russell did it as an aside too - he was really an astronomer. Russell had more time to be a scientist and in one of his papers he wrote that in the Southern Hemisphere, Anticyclones travel from West to East, and his paper was laughed to scorn in the United Kingdom. He was a graduate of Sydney University and made a fellow of the Royal Society.

Another meteorologist was Wragge who was a real character. There were many stories about him - some I can't tell. In his declining years it was said he would go around giving Met. lectures, as Mr. Hogan might do after he retires. He was a most colourful man. He wasn't just content to put in a Met. service in Queensland, he put stations in New Guinea and New Caledonia. At one stage he set up an observation station at the top of Mt. Kosciusko. During the Summer he walked up and down Mount Kosciusko every day making met. observations. He then went to Scotland and took a years observations on top of Ben Nevis.

When Wragge was making one of his trips through the Islands he saw a beautiful girl and was determined that he would have to marry her. It seemed that one of the reasons he married her was that her hair was just right for a hair hygrograph, and there is still some of Mrs. Wragge's hair in our Regional Office in Brisbane.

Things started to get serious in Meteorology in Australia about the 1930's as the airlines were developing and the Met. Services had to increase very rapidly to cope with their demands. It was just as well, because during the war the services had to be increased many times. We had stations all over the Pacific. Most of the people in the Bureau of Meteorology went into the RAAF Met. Services as forecasters and served in many places in the Pacific.

It brought new methods of observations and told us something about tropical meteorology. Europeans were always interested in the higher latitudes between latitude 40°N and the pole. Once you get closer to the Equator in the Tropics the high latitude theories don't fit, and one of the things the Australian Mets. did do during the war was make a real contribution to the knowledge of Tropical Meteorology.

War also produced improved Technology - for the first time we were making serious efforts to measure the upper air using the Radiosonde, which is a little box in which elements measure temperature, pressure and humidity and the transmitter sends them automatically back to earth. Also Radar was used for the first time.

Also during the War computers were first used - not for meteorology. One man called Von Neumann worked on these computers and realised their potential for meteorology, but they were not brought into use for another 15 years or so. Von Neumann said, at the time, that "the Science of Meteorology is as complex and difficult a puzzle as any which confronts the human mind". It is just as difficult to understand how the atmosphere works as to understand the nuclear devices which produce atomic bombs. Von Neumann could foresee the need to use computers to try and solve the great puzzle of the atmosphere that confronts the human mind.

After the war there was a tremendous upsurge in international interest in Meteorology - it started in the 1870's but probably after the World Meteorological Organisation was formed in 1951 Meteorology really began to flourish. The most significant thing that happened after that date was when the late President Kennedy said "We must do something about this space race, we mustn't use space for military purposes, we must use it for peaceful purposes. Let's find some way of using space for peaceful purposes. I suggest two ways. Let's use space for meteorological purposes, let's use space for tele-communications". This suggestion of President Kennedy's was endorsed by the whole of the United Nations Assembly and so the World Met. Organisation was given the task of finding ways of using space exploration for meteorology and it sounded a bit of a challenge.

We soon realised however, that we can use space as an observing site, somewhere to put satellites to look at the atmosphere and, as Mr. Hogan said, there are some remarkable examples on film of what the satellite can see. Everyday a satellite passes over Australia, generally 2 passes about 90 minutes apart, and, as it goes over, there is a camera in the satellite always pointing down to earth taking a photograph every four minutes. It is a television type camera, the photo that it takes is recorded in the satellite and is played back to ground stations. We have a ground station in Melbourne and another one in Darwin and one in Perth, and within a few minutes in Melbourne we have a photograph giving 600 miles x 600 miles of cloud cover over the earth and a series of these photographs forms a mosaic. Everyday we are able to see what the cloud distribution is from the mainland here down to the Antarctic and across the Indian Ocean, half way to South Africa and North up to the Phillipine Islands.

This is one way in which Kennedy's suggestion that we should use outer space for peaceful purposes rather than military purposes has borne fruit. The use of these photographs is tremendously valuable. Mr. Hogan and people in his office use this information from these satellites every day.

There are many things I could talk about in the Technological field and one, in particular, is the GHOST balloons that circle round the Hemisphere. One balloon has been up for more than a year sending messages back, floating at a constant level round the Southern Hemisphere and would have completed about 40 circuits".

Dr. Gibbs then proceeded to explain the economic benefits to the Commonwealth by virtue of the Meteorological Services provided which were estimated by an outside source to be worth $300,000,000 per year for an expenditure of $8,000,000, which is a fairly favourable balance.

Dr. Gibbs concluded by expressing his appreciation of the aims and objectives of the New Association and offered his full support to its extension to other States.

Inspector R. Calvesbert proposed a vote of thanks to Dr. Gibbs.

THE WEATHERMAN'S LAMENT

(A War Time Poem)

The bards through the ages have filled many pages
Exploiting the Infantry's glory,
They loved to enlarge on a cavalry's charge,
And make it the theme of their story.

The boys in the tanks are beginning to rank,
And the caissons keep rolling along,
While the pilot and plane will always attain,
Full credit and glory in song.

The newshounds adore the parachute corps,
The medicos come in for their praise,
But there's one poor old crew, a forgotten few,
On which glory's light doesn't blaze.

They spend their dull hours in forecasting showers,
And judging the heights of the clouds,
But their anticipation of precipitation
Elicits no cheers from the crowds.

The problems climatic are not so romantic
As shooting down Japs from the blue,
But you can bet your last dollar the fliers would holler
If the Weatherman failed to come through.

When the Bomber Command has a mission all planned
And are all set to raise hell with the Jap,
There's a question of whether alls well with the weather
Enroute to that spot on the map.

That's the Weatherman's call to get on the ball,
And get all the dope for the flight;
He can't play the breaks, or allow for mistakes,
No guessing ..... he's got to be right.

When there's nothing to clear, he'll sit on his rear,
He's lazy, that point is conceded,
He'll loaf on the job, he'll jawbone an "Ob"
And he ain't worth a damn ..... till he's needed.

PRESSURE AND WIND

By B. MASON

Since we will be referring to weather maps frequently during discussions the terms used to describe the various patterns appearing on these maps need to be explained.

1. Air Pressure

This is defined to be the weight of the column of air from the surface of observation to the top of the atmosphere. It is usually expressed as the weight or force per unit area.

In the mercury barometer, the weight of the column of air is balanced against the weight of a column of mercury. This is why the pressure used to be expressed in inches e.g. when we said that the air pressure was 30.2" we meant that a column of mercury 30.2" long balanced the weight of the air column.

The more precisely defined unit of pressure is the millibar.

1	millibar	=	0.03" of mercury (very nearly)
1000	"	=	29.53" of mercury
1016	"	=	30.00" of mercury

2. Isobars

These are the lines on the weather map joining all points where the air pressure is the same.

3. Cyclones and Anticyclones

If the pressure of the atmosphere is higher in one area than in adjacent areas we refer to this as an area of high pressure and on the weather map label it as a "HIGH".

Similarly an area where the pressure is lower than in adjacent areas is labelled a "LOW".

It is important to remember that these terms are relative; we would be more correct if we labelled the areas "HIGHER" and "LOWER".

Due to the rotation of the earth as soon as the air begins moving it is deflected towards the left in the Southern Hemisphere. As a result the air in motion, the wind, moves around regions of low pressure in a clockwise direction in the Southern Hemisphere (see Figure 1). We say that such a flow around a low pressure is cyclonic flow. Usually the whole system where the flow around an area of low pressure is clockwise is simply called a CYCLONE.

Around regions of high pressure the flow is anticlockwise and such a system is called an ANTICYCLONE.

4. Ridge

An elongated area of relatively high pressure. A "high" may have several ridges radiating from its centre. The "Anticyclonic" flow around a ridge is usually much more pronounced than the flow around a "high" where the isobars are not so markedly curved.

5. Trough

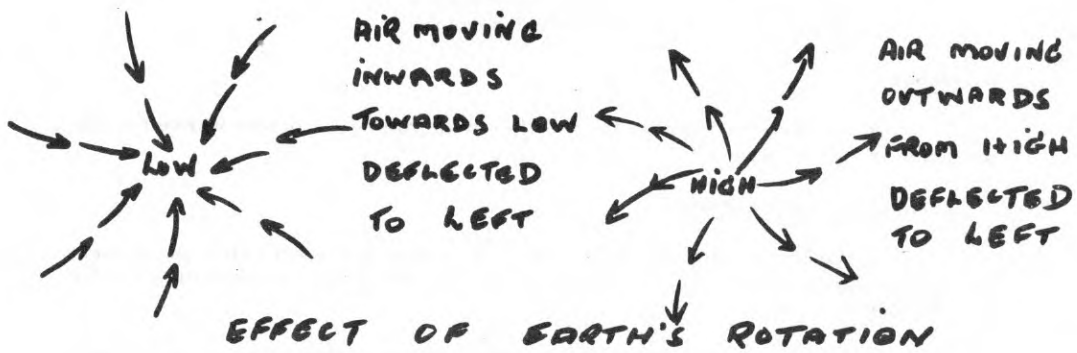
The opposite to a ridge. A trough of low pressure is an elongated area of low pressure. There is often a front lying in the trough area more or less along the trough.

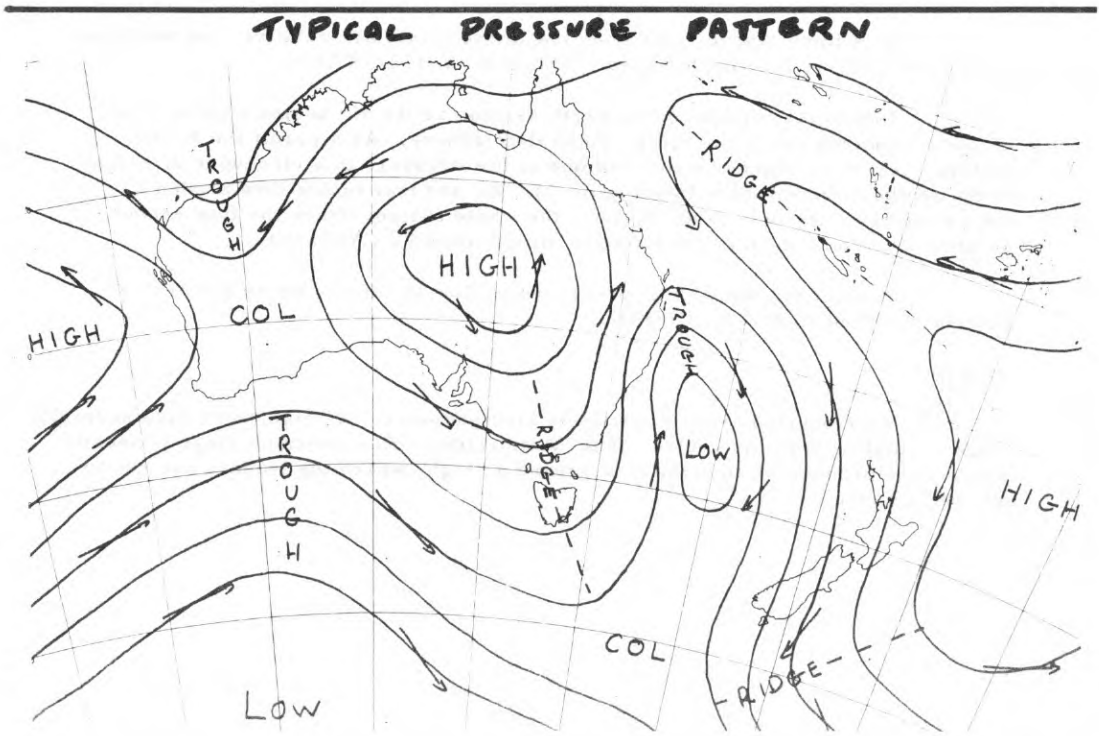
6. Col

This is the area on the weather map between two anticyclones and two regions of lower pressure. It is a region of light and variable winds.

The map shows a typical pressure pattern in the Australian region with the various pressure patterns labelled.

FIG. I.


AIR MOVING INWARDS TOWARDS LOW DEFLECTED TO LEFT
LOW
HIGH
AIR MOVING OUTWARDS FROM HIGH DEFLECTED TO LEFT
EFFECT OF EARTH'S ROTATION



TORNADO FACTS

Of all the winds that sweep this planet's surface, tornadoes are the most violent. Their time on earth is short and their destructive paths are rather small, but the march of these short-lived, local storms through populated areas leaves a swathe of terrible devastation.

It is the business of the US Environmental Science Services Administration, of which the Weather Bureau is a major element, to lessen the destructive and demoralising effects of natural catastrophe. The Weather Bureau provides the nation's first line of defence against destructive atmospheric phenomena. Through its tornado watches and tornado warnings, the USWB gives endangered persons in threatened areas time to seek shelter.

Tornadoes are local storms of short duration formed of winds rotating at very high speeds, usually in an anticlockwise direction. These storms are visible as a vortex, a whirlpool structure of winds rotating about a hollow cavity in which centrifugal forces produce a partial vacuum. As condensation occurs around the vortex, a pale cloud appears - the familiar and frightening tornado funnel. Air surrounding the funnel is also part of the tornado vortex; as the storm moves along the ground, this outer ring of rotating winds becomes dark with dust and debris, which may eventually darken the entire funnel.

On the average, tornado paths are only a quarter of a mile wide and seldom more than 16 miles long. But there have been spectacular instances in which tornadoes have caused heavy destruction along paths more than a mile wide and 300 miles long. A tornado travelled 293 miles across Illinois and Indiana in 1917 and lasted seven hours, 20 minutes. Its forward speed was 40 miles an hour, an average figure for tornadoes.

The funnel of a tornado can destroy solid buildings, make a deadly missile of a piece of straw, uproot large trees and hurl people and animals for hundreds of yards.

Tornadoes do their destructive work through the combined action of their strong vortex winds and the partial vacuum in the centre of the vortex. As a tornado passes over a building, the winds twist and rip at the outside at the same time that the abrupt pressure reduction in the tornado's "eye" causes explosive over-pressure inside the building. Walls collapse or topple outward, windows explode and debris of this destruction is driven through the air in a dangerous barrage.

When there is such complete destruction, there is usually also loss of life. In April 1965, 37 tornadoes struck the (US) midwest, killing more than 250 people and injuring more than 5,000; property damage was estimated at $300 million. Since the early 1950's the tornado death toll has averaged 123 a year with damage at $40 million annually, although it is often much higher.

Tornadoes occur in many parts of the world and in all 50 American States. They may occur at any hour of the day or night, but because of the meteorological combinations which create them, they form most readily during the warmest hours of the day. The greatest number of tornadoes - 82 per cent of the total - occurs between noon and midnight, and the greatest single concentration - 23 per cent of total tornado activity - falls between 4 p.m. and 6 p.m.

ESSA News Release
"Weather News"

THE ANEROID BAROMETER

How to Use It To Make Your Own Forecasts

by

J. HOGAN

The Mercury Barometer is the most accurate type of barometer and is most commonly used by official weather reporting stations, but the cost is too high and its size too great to lend itself to ordinary household use. Most of the early references to pressure describe "the glass" as falling or rising. It is not known what the exact origin of this term is except that it may refer to the glass which normally surrounds the top of the mercury and the scale in a mercury barometer. Mercury is used because of its great density and low freezing point. We could have a water barometer but it would require a column of water about 30 to 40 ft high. We would need to make provision for it poking through the roof of a house which would also make it very difficult to read.

There is another interesting type of barometer about which most of you have probably never heard, and I would like to read the following extract from an article published in 1806 which was as follows -

"A phial of water, containing a leech, I kept on the frame of my lower sash chamber window so that when I looked in the morning, I could know what would be the weather on the following day.

If the weather proves serene and beautiful, the leech lies motionless at the bottom of the glass, and rolled together in spiral form.

If it rains, either before or after noon, it is found crept up to the top of its lodging and there it remains till the weather is settled.

If we are to have wind, the poor prisoner gallops through its limpid habitation with amazing swiftness and seldom rests till it begins to blow hard.

If a remarkable storm or thunder and rain is to succeed, for some days before, it lodges almost continually without the water, and discovers uncommon uneasiness in violent throws and convulsive-like motions.

In the frost, as in clear summer weather, it lies constantly at the bottom; and in snow, as in rainy weather, it pitches its dwelling upon the very mouth of the phial. What reason must be assigned for them, I must leave philosophers to determine. Perhaps it may not be amiss to note, lest any of the curious should try and experiment, that the leech was kept in a common eight ounce phial glass, and about three-fourths filled with water and covered on the mouth with a bit of linen rag. In the Summer the water is changed once a week and in Winter once a fortnight".

If any of you know the whereabouts of any leeches we would like to experiment with one at the Weather Bureau as it might assist us sometimes with our forecasts.

We now come to the Aneroid Barometer with which most of you are familiar and probably have one hanging on the wall at home. You probably have also developed the habit of tapping it each time before reading it, but has anyone wondered just why he does this? I remember asking one young chap why he did it and he replied that he didn't know, but his father always did it and he just copied him. The fact is that the ordinary aneroid type suffers from Hysterisis, or time lag in operation, due to the complicated mechanism which operates the hands, and the tapping only helps to release the tension and bring the hand to the correct position. Attached to the outside of the glass is usually a small knob which can be used to turn the hand and superimpose it on the indicating hand attached to the pressure unit.

The pressure measuring unit in the aneroid barometer is a small flexible metal capsule partly exhausted of air to compensate for temperature changes in the elasticity of the metal. When heated the small amount of air inside the capsule expands and compensates for the stretching of the metal. There is no need to give any more detailed explanation of the operation of the equipment which is described in the accompanying pamphlet "The Aneroid Barometer and How to Use It", issued by the Bureau of Meteorology.

However, there are certain other aspects which are not covered in the pamphlet and which you should know if you wish to use the instruments more intelligently. For instance, the wording on the dial of most aneroids can at times be very misleading and in fact on occasions the hand may be pointing to rain when we are having one of our worst heat waves in S.A. Further reference to this will be made later.

There is also quite a lot of misunderstanding regarding adjustment of the aneroid for the varying heights above mean sea level and for remote locations. My advice to you on this matter is to forget about adjustment for height above sea level and, if you happen to live within a radius of about 20 miles of the metropolitan area, just listen to the pressure reading broadcast over the radio and T.V. stations and adjust your barometer to read the M.S.L. value. This can be done by inserting a screwdriver in the screw at the back of the instrument. If you then make a check for the next few days with the broadcast barometer pressure readings the readings on your own instrument should be approximately the same although there is always some slight variation due to the not quite 100% efficiency of these instruments.

For people located at distant locations it is a little more difficult but they should enquire as to the location of the nearest official pressure recording station and if they are within a reasonable distance, say, 20 to 30 miles, this pressure should suffice. If not, they should take a reading at, say, 3 pm or one of the other times of publication of weather maps in the newspapers and then try and determine the isobars on which they were located at the time. After two or three attempts a mean value which is sufficiently accurate for normal purposes can be established.

Now I will try to explain how the aneroid barometer can be used for forecasting. In the first place it should be stressed that the actual pressure as read off the dial is not always a good indicator of the weather. As mentioned before with low pressure it can either be raining or extremely hot. We prefer to study the rate of change in pressure which is a much better indicator of developments. We, at the Bureau, are fortunate to have barographs and micro barographs which have a greater amplification than ordinary barographs and record pressure changes on either weekly or daily charts. We also have available the normal diurnal (daily) pressure change with which to compare the actual changes taking place throughout the day. In other words if the pressure systems all stop still for a day the pressure at a particular station would still show a wavy line with two high and two low points during the day. The high points being around 9-10 a.m. and p.m. and the lower points at approximately 3 to 4 a.m. and p.m. We therefore are more concerned with comparing the changes, say, in another three hours with the normal change. In other words if the pressure falls a certain amount between 9 a.m. and noon and this happens to be exactly equal to the normal, then no development is taking place. Should it be higher than the normal change then we consider the pressure was actually rising. If it is lower than the normal pressure change some development is taking place. In other words we deal with what is known as corrected barometric tendencies.

Now to help you do the same, I have included in each copy of "The Aneroid Barometer" pamphlet the normal diurnal pressure changes for Adelaide in Summer and Winter. To use these with your aneroid you should adjust the moveable hands to coincide with the indicating hand at the beginning of one of these periods and notice the rise and fall at the end of the period. Then by comparing it with the normal you will have an indication as to what the real pressure change is. As an example, if your aneroid showed a fall of .08" between 9 a.m. and 3 p.m. in the Winter it would be falling .03" more than normal. However, one has to be very careful in making this assumption because the barometer pressure may have fallen to, say, .12" up to a short time before 3 p.m./ but because of a change at, say, 2.30 p.m. it is now actually rising.

This is where the Bureau reports of rising and falling sometimes conflict with those apparent to the observer using an aneroid because the Bureau pressure changes or tendencies are given during the last hour are not necessarily the same as those for the three hours.

Now we come to the important part of this address and that is how to use this information to prepare your own forecasts. To make this easier for you to understand a small duplicated sheet showing relationship between wind, pressure and expected weather has also been included in the pamphlet. It is rather difficult to explain these in detail without the use of a blackboard but I think they are rather self-explanatory, particularly if the weather charts published in the newspapers are studied in conjunction with the observation of pressure tendencies. In relation to wind observation it must be emphasised that, particularly near the coast, and in some areas where there are marked local wind effects, it is necessary to consider the upper wind pattern rather than, say, local sea breeze or gully winds. This can best be done by observing the direction of movement of low clouds when available as these are a more reliable indication of the wind stream than the surface winds. If not, one must study the weather map to give some idea of the true wind flow. However, it is not expected that you will become efficient without a considerable amount of experience and it is hoped that at some later date we will be able to discuss certain situations in which you were not able to correlate winds and pressure changes with the expected weather.

We have one other type of barometer known as the digital barometer which works on the principle of using an electronic device in association with the normal aneroid metal capsule but, instead of the capsule having to operate a set of levers and indicators, the operator turns a small knob to which is attached a direct reading indicator. Contact is made with one side of the capsule and breaks the light circuit which is connected to the other side of the capsule. The reading of the counter gives a very accurate measurement of the pressure and it can be demonstrated by removing it from the floor to the top of the table and a fairly reliable measurement can be made. The digital barometer is used for checking the accuracy of the mercury barometers in the field.

"GOOD-MORNING MRS. SMITH; AND A FEW SHOWERS LATER".

NIMBUS - 3

The largest-yet US weather satellite Nimbus-3 was launched from the Western Test Range, California, in April.

Nimbus-3 is a replacement for the ill-fated Nimbus B1 which was destroyed in a launch malfunction in May last year. On board the new craft are several scientific experiments - the main ones of interest to the Bureau are the high resolution infrared radiometer (HRIR) and direct readout image dissector (DRID) cloud camera.

HRIR transmits night-time "pictures" of infrared radiation from the earth. Cloud formations and land masses affect levels of infrared radiation and are thus visible at night to the infrared sensors.

Day-time cloud pictures are transmitted by DRID and these are similar to the familar APT pictures transmitted from ESSA 8 but are received three hours later. Analysts now have real-time pictures every 90 to 120 minutes from 0630 to 1500 as well as at least two orbits of infrared around midnight.

The successful reception of Nimbus transmissions is the culmination of much preparation work for the new satellite, most of which fell on the shoulders of Harry Luke and Alex Rainbow, Bureau of Meteorology Comm. Section techs. Harry had the task of converting the Bureau's satellite facsimile machines to suit the format of the HRIR transmissions.

The APT room at Exhibition Street, Melbourne, is now running 24 hours a day in order to handle data from ESSA 8, Nimbus-3 and ATS-1, the stationary-orbit satellite over the Pacific. The number of APT operators has been increased to seven to handle the extra work.

Nimbus-3, built for and launched by the National Aeronautics and Space Administration, weighs 1269 lbs and stands 10 ft high. It has been placed in a circular nearly polar orbit 690 statute miles high and orbits the earth every 107 minutes, viewing the entire planet twice daily.

STORM RESEARCH

Scientists from the National Severe Storms Lab. in Norman, Oklahoma, are carrying out a study of severe storms and associated lightning, hail, high winds and tornadoes over the Oklahoma plains and urban areas. Seven aircraft, eight upper air sounding stations, extensive ground facilities and several types of radar will be used in the research program, which involves the co-operative efforts of NSSL and other government agencies and groups.

This concentrated attack on thunderstorms and their offspring, begun five seasons ago, yields a wealth of new data each year. The 1969 (northern) spring research is designed to continue basic studies of storms with added emphasis on observing them in urban areas. A surface network of 20 met. monitoring stations is spread in a dense pattern to measure pressure, temperature and speed and direction of surface winds. While the surface network documents conditions near the ground, eight interspersed stations will provide similar measurements upward through the atmosphere.

Rawinsonde instruments are to be launched every 30 minutes during stormy periods.

The aircraft in this year's program will be doing varied jobs. The US air force is providing a high altitude jet equipped to photograph the clouds beneath it from horizon to horizon every 30 seconds. A plane from the Canadian National Research Council will study the so-called "thin line" which appears ahead of a squall line on the radarscope.

Two other research organisations are joining NSSL in its study of electrification. Oklahoma State University will measure the polarisation and noise characteristics of burst of lightning radiation; the ESSA's Research Labs. plan to attempt a close-in measurement of electrical radiation from a tornado.

"Weather News"

A STATIONARY LOW NEAR MOUNT GAMBIER

FROM 1/2/69 to 4/2/69

By M. WILLIAMS

On 1/2/69 a small low pressure system developed near Mount Gambier. The low was weak and almost vertical in structure. This is shown in Figures 7 and 8. Figure 7 depicts the surface chart at the time and Figure 8 shows the corresponding wind structure at 10,000 ft. As can be seen, the low on the upper chart which is drawn in much the same way as a surface chart, is near the surface low, but is also placed slightly to the West of it.

Under these conditions with an upper low in this position, the surface low will remain nearly stationary and also maintain about the same intensity. Thus, it could be expected that the surface low will remain static as long as this upper low remains stationary.

In this particular situation, the lows at both levels are trapped in a large belt of high pressure which virtually wraps itself around the lows and hence does not allow them to move.

The reason for the formation of such an intense high, which is trapping the low, is largely the presence of what is called a long wave ridge south of South Australia. Without explaining what is meant by a long wave ridge, it is a region which is highly favourable for the development of intense slow-moving highs.

Therefore, in this situation there is a large high in a long wave ridge which is trapping a low at 10,000 ft. and at the surface. Also, due to the fact that the ridge does surround the low at these levels there is no opportunity for cold air to be injected into these systems from the south and so intensify the lows. Hence, according to all current theory the low should remain stationary and at about the same intensity near Mount Gambier.

This in fact happened.

Figures 9 and 10 show the positions of the upper and lower lows in much the same positions one day later.

Figures 11 and 12 show the lows again in much the same position; however, a change is apparently taking place, particularly at 10,000 ft where the large high is breaking down. The stream is gradually turning to a Westerly and the low is weakening into a trough.

Figures 13 and 14 show that both lows have weakened to troughs and are moving to the east in the Westerly stream at upper levels.

Hence, the surface low near Mount Gambier has obeyed the lows of Meteorology and remained static for about three days until the upper low was broken down and degenerated into a trough in a Westerly stream.

There was little rain with this system, due largely to the lack of moisture at upper levels.

M.S.L CHART
9a.m.
1/2/69

7

UPPER AIR CHART
700 MBS (10,000')
9a.m.
1/2/69

8

M.S.L CHART
9a.m
2/2/69

9

UPPER AIR CHART
700mbs (10,000')
9a.m
2/2/69

10

M.S.L. CHART
9 a.m.
3/7/69

(11)

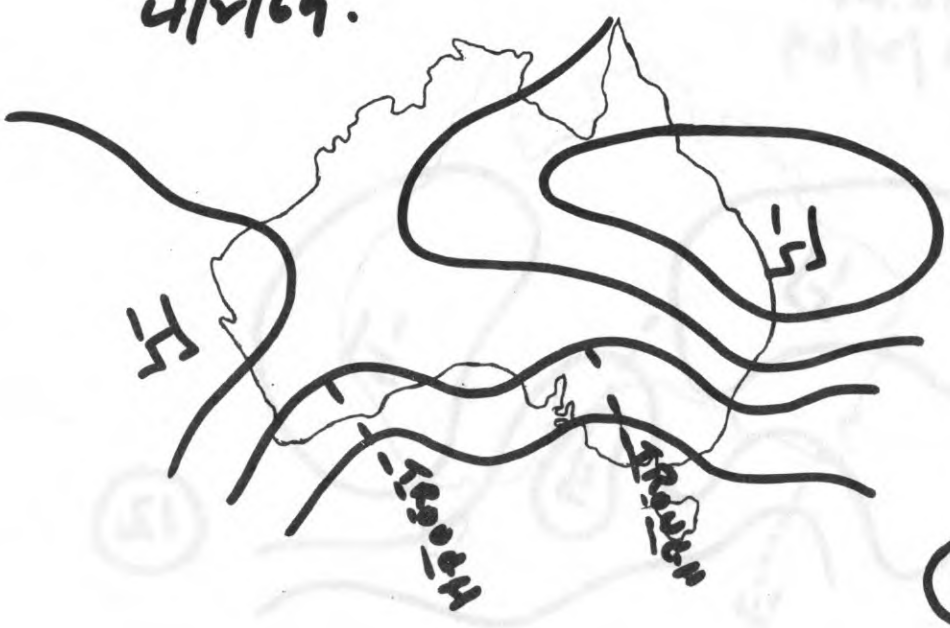
UPPER AIR CHART
9 a.m.
3/7/69

(12)

M.S.L. CHART
9a.m.
4/7/69

13

UPPER AIR CHART
9a.m.
4/7/69.



14

A GENERAL RAIN SITUATION OVER S.A. - FEBRUARY 1969

By L.R. MITCHELL

A weather pattern developed over Australia during February 1969 which resulted in widespread heavy rain in the Northern Territory, S.A., Victoria, N.S.W. and south Queensland. The period concerned was from 2nd to 13th. Many gaugings were of the order of 5", with some areas reporting aggregate totals in excess of 7".

The system responsible was unique for several reasons -

(a) the vast quantity and areal coverage of rainfall,

(b) the persistence of the rain - producing system over many days, and

(c) the tremendous distance covered by the main depression centre.

Path of Rain Depression

The track of the surface low pressure system is indicated in Figure 1. It is represented from 2nd February when for several days it was a tropical disturbance operating around the Far Northwest coast, generally West of Wyndham. During 2nd to 7th it brought a considerable amount of rain to this area, which doesn't concern us much. However, from 7th onwards it began to near this State and 8th and 9th saw a considerable amount of rain over S.A.

In passing - it is easy to gain the impression that the low maintained its identity over this long track during this long period. This of course, is not the case. Depicted are consecutive low positions on charts 24 hours apart and on several occasions one low has weakened and another, for various reasons - mainly associated with upper-air development - has become the main influence. In brief, then, Figure 1 indicates the position each day of the main centre of low pressure.

Aggregate Rainfall Totals

Figure 2 shows a smoothed version of the aggregate rainfall for the period 7th to 13th February. Neglected in this are all falls in the Territory and Northwest Western Australia up to 6th and all other falls less than 1".

Salient features are -

(1) the apparent "skip-distance" between the heavy rain area around Giles and that over Eastern S.A., and

(2) the very heavy gaugings over the N.S.W. coast (parts of the Sydney Metropolitan area registered over 10").

Surface Patterns

Figures 3, 4 and 5 are the 9 a.m. Surface Charts for the 7th, 8th and 9th February. Note that on 7th the surface circulation over W.A. was still very intense, the depression centre having just moved in from the sea and being still subject to vigorous infeed of warm moist air. By contrast, the surface circulation was further inland and weaker on 8th, but by 9 a.m. on 9th had moved out to sea off Port Lincoln and was again intensifying.

A feature of these three charts, indicated by the associated rain shadows, is the occurrence of most rain in the Southeast quadrant of the system. This is the general picture for situations of this type, for reasons which space prevents detailing in this instance.

The Forecast Problem

In so far as S.A. was concerned, the main forecasting task lay in assessment of the rate and direction of movement of the rain area - particularly during 7th and 8th. The answers to this were to be found - not on the surface but, as is frequently the case, in the upper-air developments.

Upper Circulations

The 500 mb (or 20,000 feet) chart for 3 p.m. on 7th February is shown in Figure 6. The almost classical trajectory of the fast North to Northwest flow on the Eastern side of the upper cut-off low is evident, transporting warm moist air at this level into the S.A. region.

At the same time the 700 mb (or 10,000 feet) chart (not shown) presented a very similar picture at this lower level. In other words, the core of this system was practically vertical at this stage - therefore slow-moving and productive of much rain over one area.

By the next day, very considerable movement Southeastwards of the 700 mb low was evident (Figure 7) together with strengthening of the Northerly flow aloft over S.A. By contrast, the 500 mb low had not moved nearly so far (not shown). It will be recalled that the surface low also moved very fast on this day (Figures 4 and 5). In summary, the system, in depth, had lost its vertical structure and become fast-moving in low levels. This was reflected markedly in the rainfall pattern (Figure 2) which featured the "skip-distance" mentioned earlier.

On the 9th February, the 500 mb low had moved out to sea, Southwest of Port Lincoln (Figure 8) with the 700 mb centre (not shown) in the same location. Together with the position of the surface low on this day (Figure 5) it was evident that the system had again reverted to near-vertical in structure and therefore had again become slow-moving.

This is borne out by the fact that heavy rain did not commence to fall at Mount Gambier until midnight on 9th. This was also aggravated by the development of a high-pressure ridge in this area, which had the effect of accentuating lift to the North - i.e. in the Murray Mallee and Southeast districts and would have been a contributing factor to production of the higher falls in these areas.

Other Considerations

To keep this short summary to reasonable dimensions, no account has been given of the upper thermal patterns, moisture structure and stability considerations associated with this system. Considerable attention to these, in conjunction with all other available data, is necessary for accurate forecasting in these situations.

Implications of the Rain

This amount of rain, occurring in February, was bound to meet with a mixed reception.

On the one hand, followed as it was by another general rain later in the month, and by still another in March, it played havoc with the fruit-drying industry in river districts of S.A.

By the same token, the terrific growth of green grass which followed, all over the country and away out of season, brought to a premature end what commenced as a potentially very bad fire season.

One man's meat will always be another's poison.

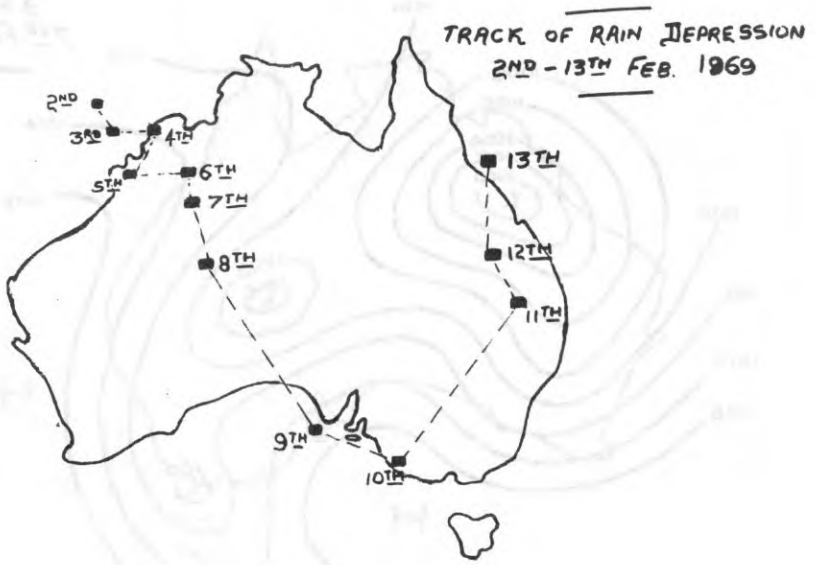

TRACK OF RAIN DEPRESSION
2ND - 13TH FEB. 1969
2ND
3RD
4TH
5TH
6TH
7TH
8TH
9TH
10TH
11TH
12TH
13TH

FIG 1.

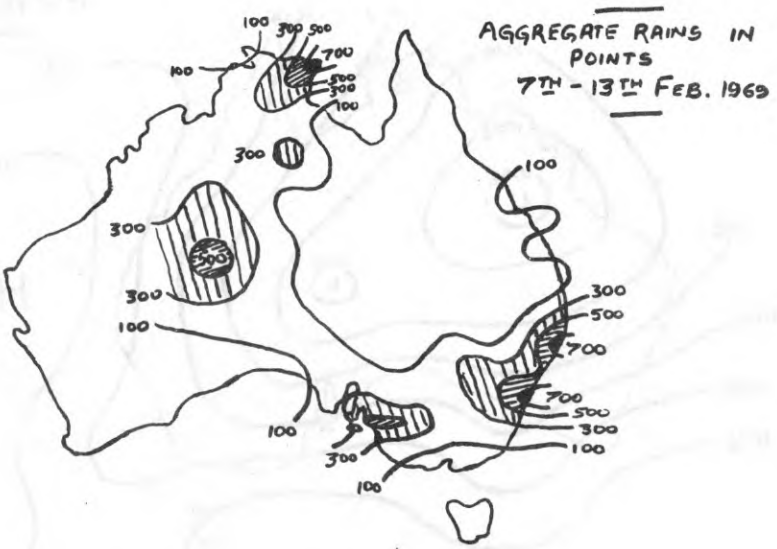

AGGREGATE RAINS IN POINTS
7TH - 13TH FEB. 1969
100
300
500
700

FIG 2.

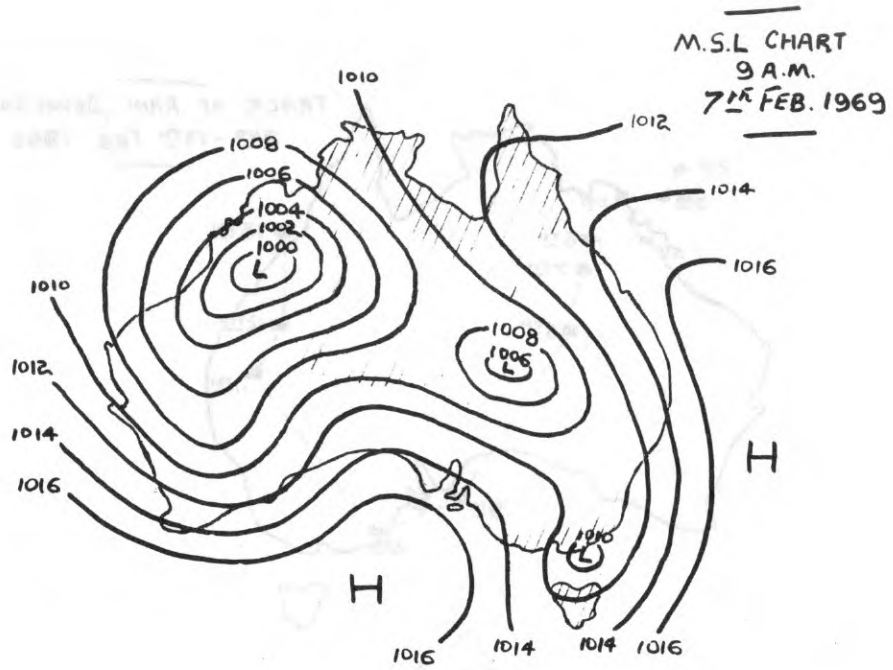

M.S.L CHART
9 A.M.
7TH FEB. 1969
1010
1012
1008
1006
1004
1002
1000
L
1014
1016
1010
1012
1014
1016
1008
1006
L
H
1000
L
H
1016
1014
1014
1016

FIG 3.

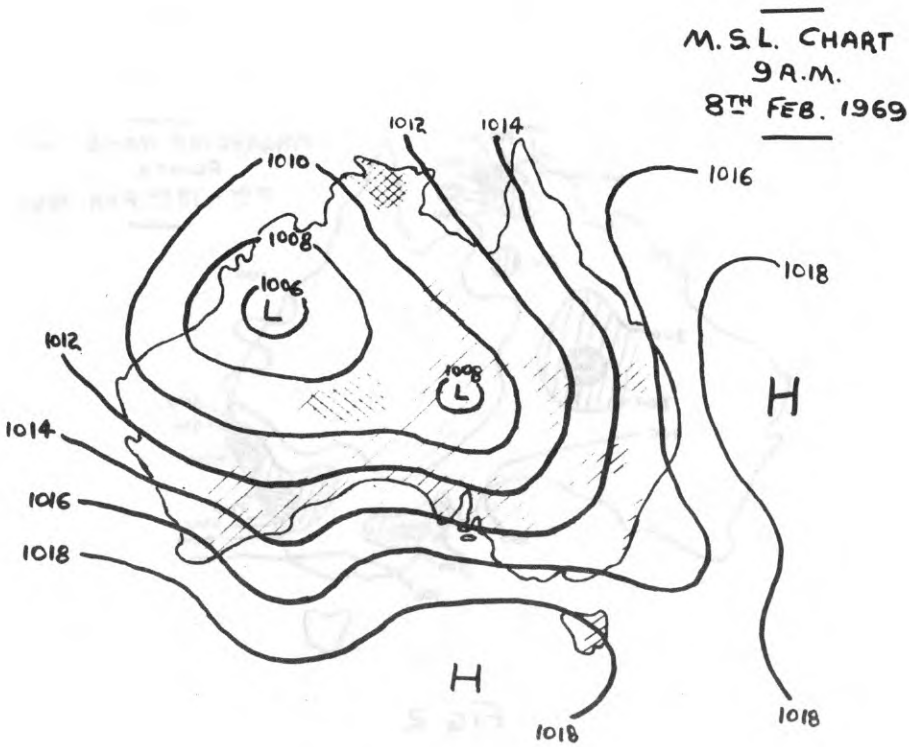

M.S.L. CHART
9 A.M.
8TH FEB. 1969
1012
1014
1010
1016
1008
1018
1006
L
1012
1008
L
H
1014
1016
1018
H
1018
1018

FIG 4.

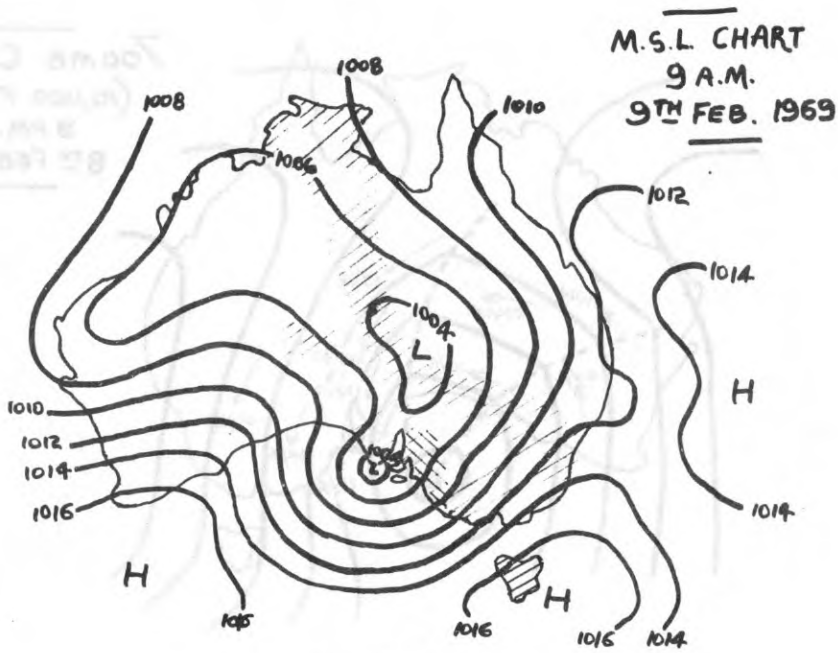

M.S.L. CHART
9 A.M.
9TH FEB. 1969
1008
1008
1010
1006
1012
1014
1004
L
H
1010
1012
1014
1016
H
1014
1016
1016
1016
1014

FIG 5.

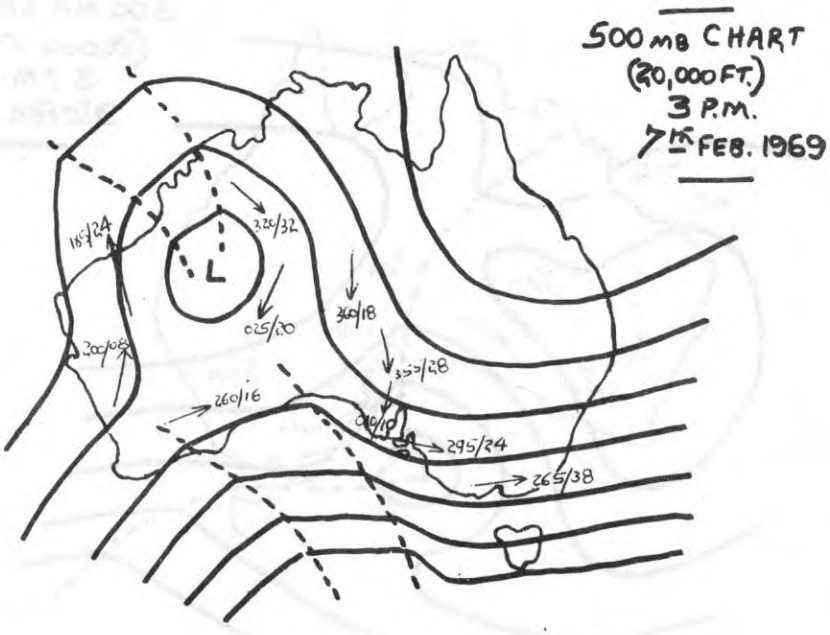

500 MB CHART
(20,000 FT.)
3 P.M.
7TH FEB. 1969
L
185/24
320/32
025/80
360/18
355/28
300/08
260/16
010/12
295/24
265/38

FIG 6.

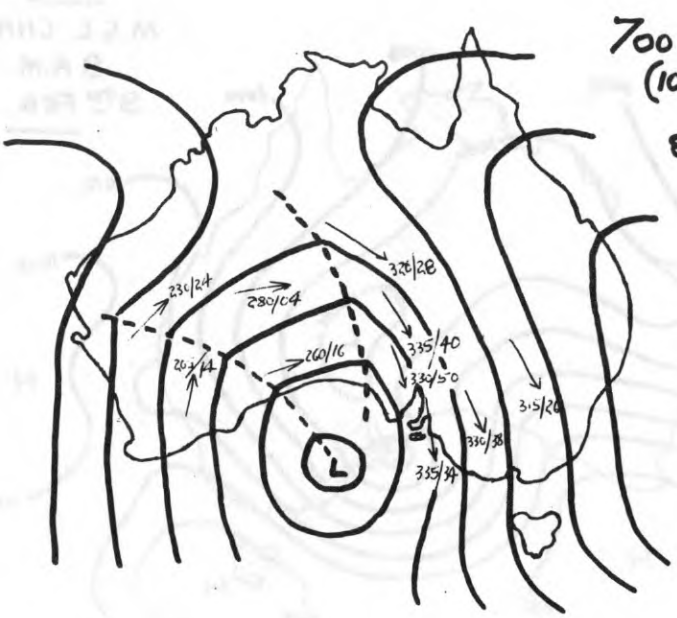

700 MB CHART
(10,000 FT)
3 P.M.
8TH FEB. 1969
326/28
234/24
280/04
335/40
260/16
335/50
315/26
336/38
335/34
L

FIG 7.

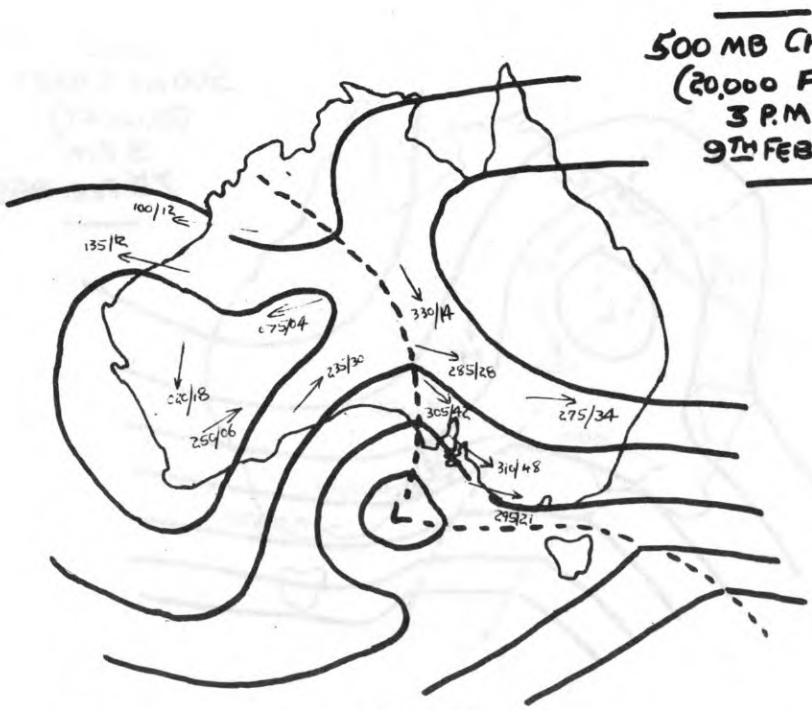

500 MB CHART
(20,000 FT)
3 P.M.
9TH FEB. 1969
100/12
135/12
330/14
275/04
285/28
233/30
305/42
275/34
314/48
295/21
L

FIG 8.

DISCUSSION OF TWO INTERESTING METEOROLOGICAL SITUATIONS

By J. HOGAN

Chart 1 shows a weak wave of low pressure developing upon a front which has just passed through Melbourne.

Chart 2 shows the development which took place by 3 p.m. the following day.

These small low pressure waves have two main characteristics. They either move rapidly along the main front at a rate varying between 20-50 miles per hour, or they remain stationary and intensify.

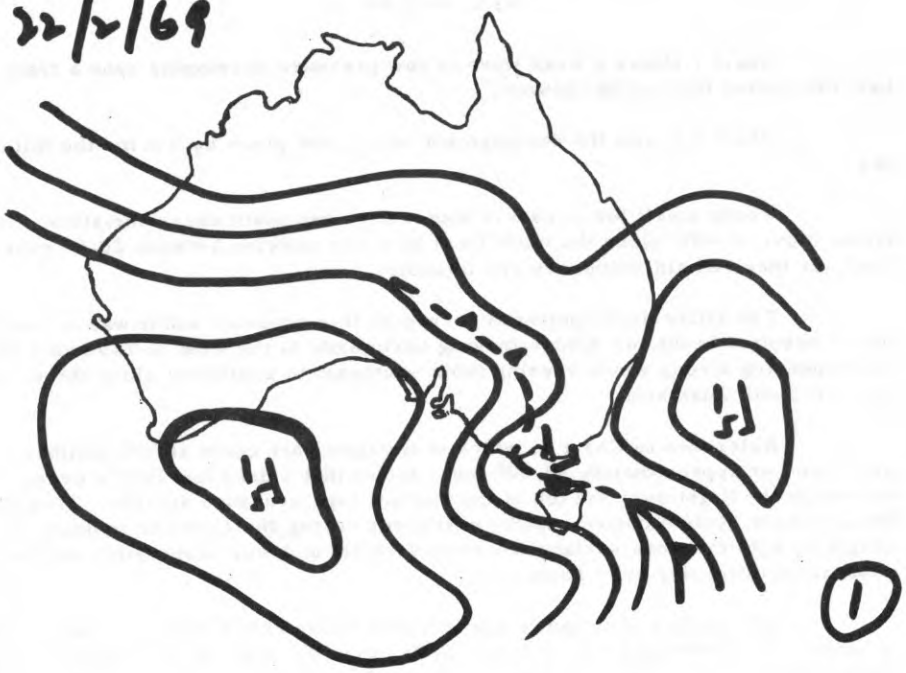
The latter development occurred on this occasion and it was so marked that it resulted in the low centre moving backwards to the west of Tasmania with accompanying strong winds veering from southeast to southwest along the southern coast of South Australia.

Reference to Chart 3, which is the upper air chart at 300 millibars pressure, or approximately 30,000 feet, shows that a deep low centre pressure existed in the Bight over the top of the surface high pressure system. This upper low pressure system moved rapidly eastwards during the 22nd and in doing so caught up with the weak surface low over Victoria and was responsible for the subsequent deepening over Tasmania.

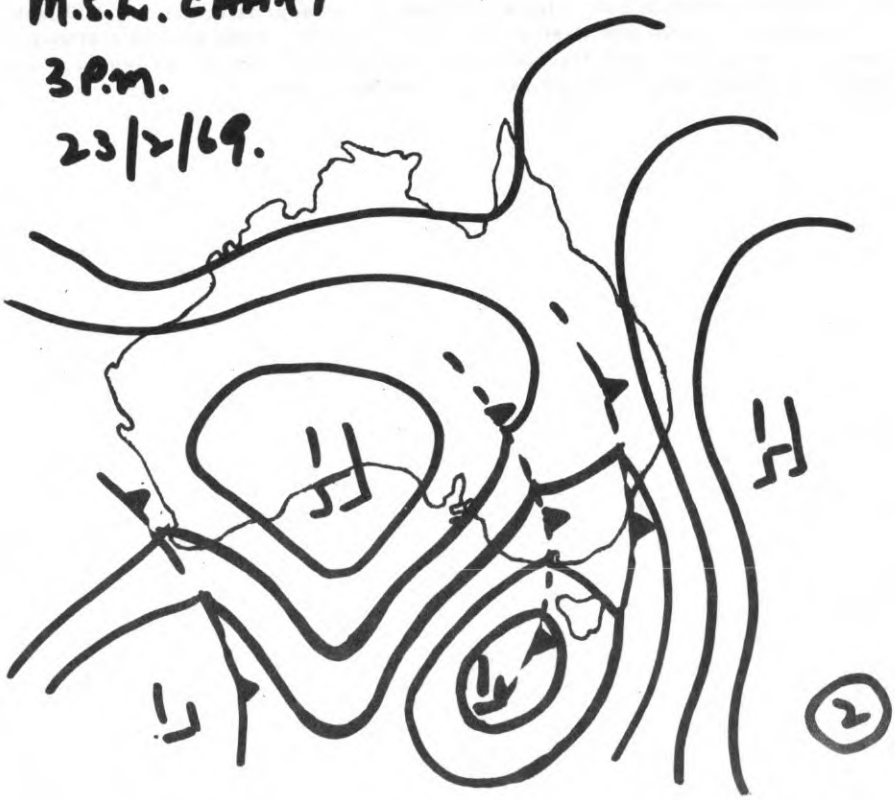
The second situation is one in which heavy rain and violent thunderstorms occurred over western Victoria and N.S.W. when the surface low pressure system was located east of Sydney as shown in Chart 5 for 9 a.m. on the 31st March 1969.

This unusual development was due to the location of a complete "cut-off" low pressure system at 500 millibars pressure, or approximately 20,000 feet, over northern Victoria and western N.S.W. (Chart 6). This caused a strong inflow of moist northerly air over the cold southerly stream in the lower levels which resulted in warm frontal type of rain and thunderstorms.

M.S.L. CHART
3 pm.
22/2/69



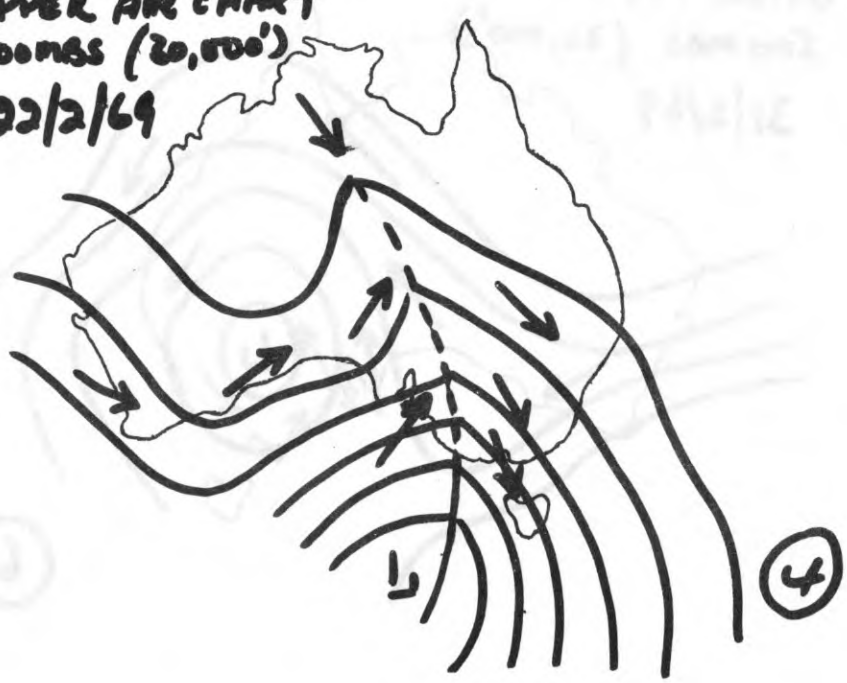
M.S.L. CHART
3 P.M.
23/2/69.



UPPER AIR CHART
300 MBS (30,000)
21/2/69

3

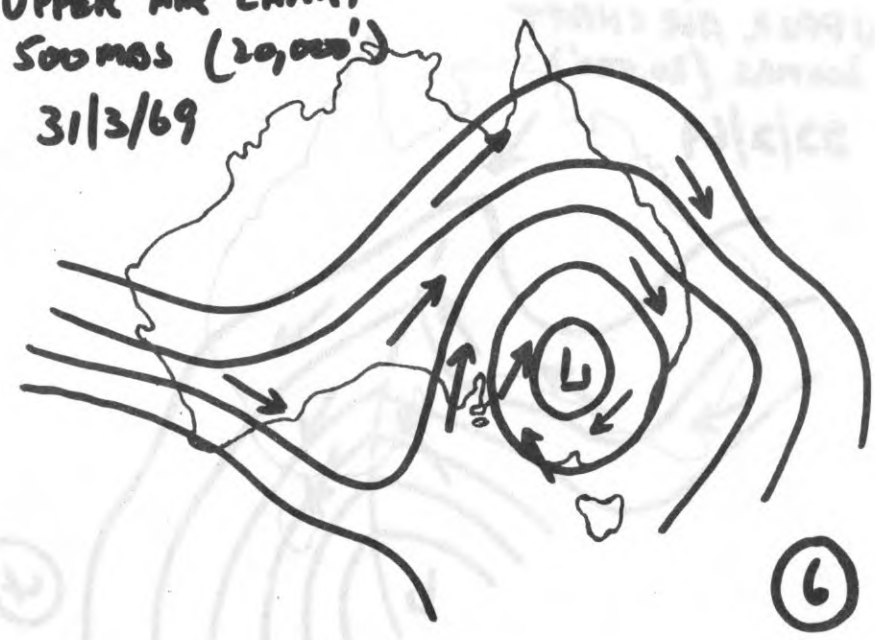
UPPER AIR CHART
300 MBS (30,000')
22/2/69



4

M.S.L. CHART
9 a.m. 31/3/69

UPPER AIR CHART
500 MBS (20,000')
31/3/69



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